

**Discussions Notes from**  
**Advanced Concept ARO 200 Centrifuge Workshop**  
**US Army Corps of Engineers**  
**Engineer Research and Development Center - Vicksburg, MS**  
**January 31 – February 1, 2001**

**D. Session on the Future of Centrifuge Modelling -- Thursday, February 1**

**Lecturer:** Prof. Hon-Yim Ko - University of Colorado  
**Moderator:** Dr. Ryan Phillips - Center for Cold Oceans Research  
Engineering  
**Co-Panelists:** Prof. Ricardo Dobry, Renselaer Polytechnic Institute  
Prof. Patricia Culligan, MIT  
Prof. Deborah Goodings, University of Maryland  
**Discussion notes by:** Silas Nichols, University of Maryland

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*Comment by Dr. Clukey:*

Centrifuge modeling should take the step toward use as a design tool. However, the use of centrifuge modeling in verifying foundation designs requires a look at developing standards and codes for modes of testing. Design jobs are going to be bid, and independent labs must be capable of producing similar results. As yet, this is not the case in the centrifuge community.

*Response by Dr. Kutter:*

Centrifuge equipment is developed in different sizes and shapes. He felt that it would be difficult to standardize centrifuges and equipment. Specifically, specialized equipment like shakers.

*Response by Dr. Dobry:*

He thought that Dr. Kutter's comments were dangerous in that we should not expect to get different results for the same test. It is absolutely necessary for the community to be repeatable in its experiments.

*Response by Dr. Phillips:*

Commented that Japan has started some work in standardizing testing, but they don't want to stifle creativity.

*Response by Dr. Hynes:*

She commented that codes would ensure similarity and reduce extreme differences in design. She felt that there was a need to take a closer look at the combination of time, frequency and energy in earthquake/shake tables to refine/define the loads applied. This would be a significant step.

*Question by Dr. Zimmie:*

He asked the group about the use of centrifuges for educational purposes. For example, their use in classes for illustrating simple design problems.

*Response by Dr. Ko:*

The University of Colorado has three centrifuges. One is used specifically used for undergraduate classes. He cited some examples of teaching uses.

*Response by Dr. Culligan:*

She commented that M.I.T. has used the centrifuge for several years in geotechnical classes. Students don't actually use the centrifuge, but they do analyze test data.

*Response by Dr. Zimmie:*

RPI uses the centrifuge only for demonstrations for the students.

*Comment by Dr. Phillips:*

There is a need to expand the client base for the centrifuge community. Clients need to see the centrifuge as a worthwhile design tool. The community needs to educate practitioners on the cost and usefulness.

*Comment by Dr. Gran:*

The centrifuge community needs to demonstrate fidelity to the consumer, show how it works, the benefits and the applicability.

*Question by Dr. Schaminee:*

He asked if anyone had done any research in engineered caps to deter/defer water? Subsiding landfills? Seismic stability of landfills?

*Response by Dr. Culligan:*

She commented that 1g tests had been done to look at caps and subsidence.

*Response by Dr. Stone:*

He commented that he was aware of research on deformation of liners (base and cap) possibly at the Auburn University. That work may be referenced in Centrifuge '91. It involved the use of soils with particle sizes ranging from gravel to bentonite, placed dry and allowed to expand, becoming impermeable.

Various people commented on research areas pertaining to ice ridges as it relates to contaminant spills in frozen soils; specific uses of the centrifuge in extreme climate changes such as global warming; stability of land masses, beach erosion, melting of permafrost, and iceberg scour.